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(54) **METHOD FOR SUPPORTING MUTUAL EXCLUSION FUNCTION AND DRM DEVICE THEREOF**

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G06F 15/16 (2006.01)

(52) **U.S. Cl.** 709/229; 709/219

(58) **Field of Classification Search** 709/200-203, 709/217-229

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,287,444 A * 2/1994 Enescu et al. 715/234

5,692,178 A	11/1997	Shaughnessy	
2001/0034609 A1 *	10/2001	Dovolis	705/1
2002/0002413 A1	1/2002	Tokue	
2002/0065778 A1 *	5/2002	Bouet et al.	705/57
2002/0184191 A1 *	12/2002	Marpe et al.	707/3
2003/0187860 A1	10/2003	Holland	
2003/0217010 A1	11/2003	Stefik et al.	
2004/0117490 A1	6/2004	Peterka et al.	
2005/0177625 A1 *	8/2005	Paek et al.	709/219

FOREIGN PATENT DOCUMENTS

KR	10-2005-0001701 A	1/2005
KR	10-2005-0039537 A	4/2005
KR	10-2005-0096036 A	10/2005
KR	10-2006-0046427 A	5/2006
WO	WO 2004-044821 A	5/2004
WO	WO 2005-124606 A	12/2005

OTHER PUBLICATIONS

D. P. Bovet & M. Cesati "Understanding the Linux Kernel" The Virtual Filesystem—File Locking, Chpt. 12; pp. 366-371, O'Reilly, USA 2001, XP002478230.

* cited by examiner

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(57) **ABSTRACT**

A mutual exclusion method and DRM device is provided. The mutual exclusion method includes receiving an instruction associated with a predetermined stored file from the CE device, checking whether a performing instruction being performed associated with the predetermined stored file exists, and generating a collision error message informing that a collision error has occurred due to the inputted instruction when the performing instruction being performed associated with the predetermined stored file exists.

20 Claims, 4 Drawing Sheets

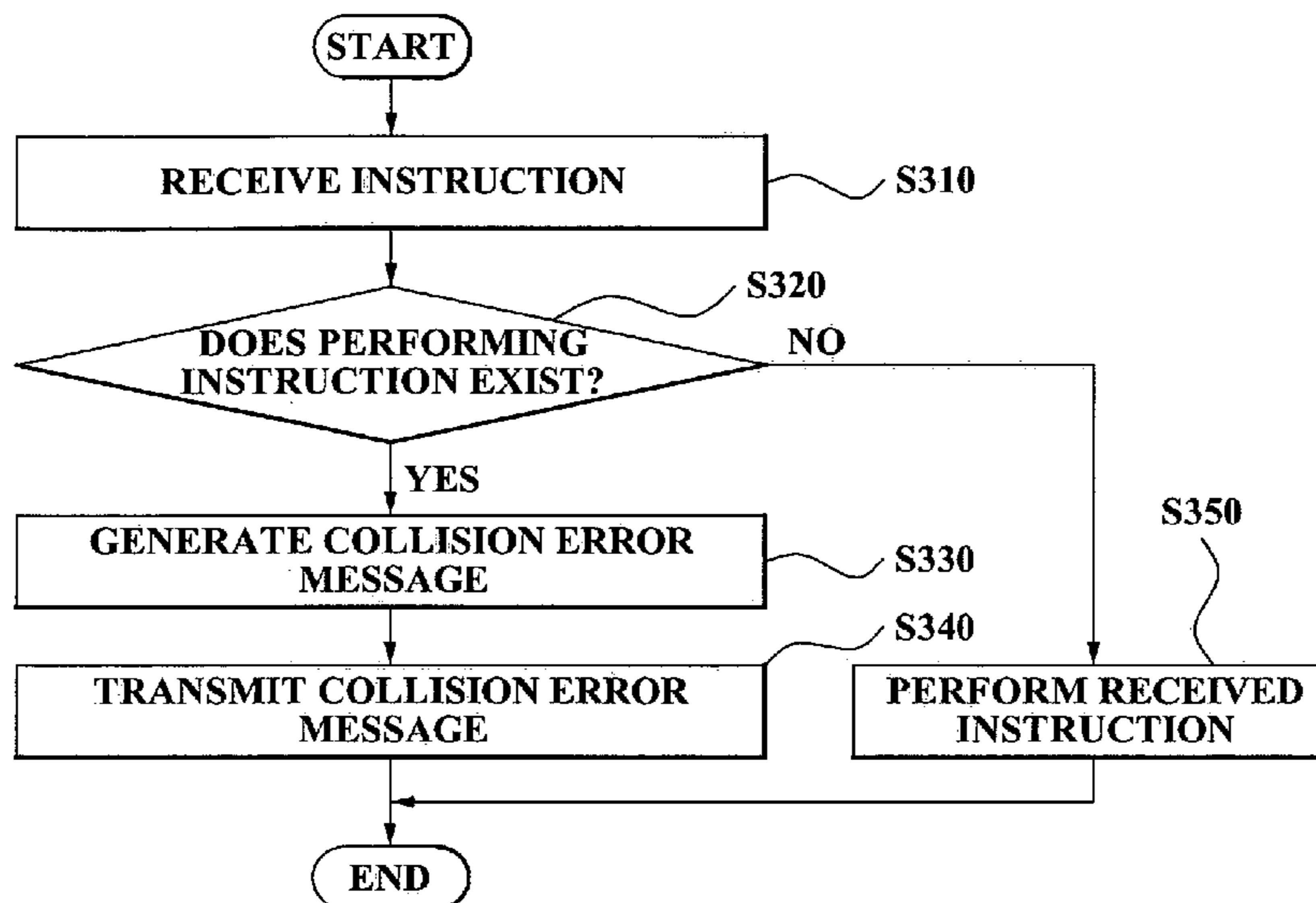


FIG. 1

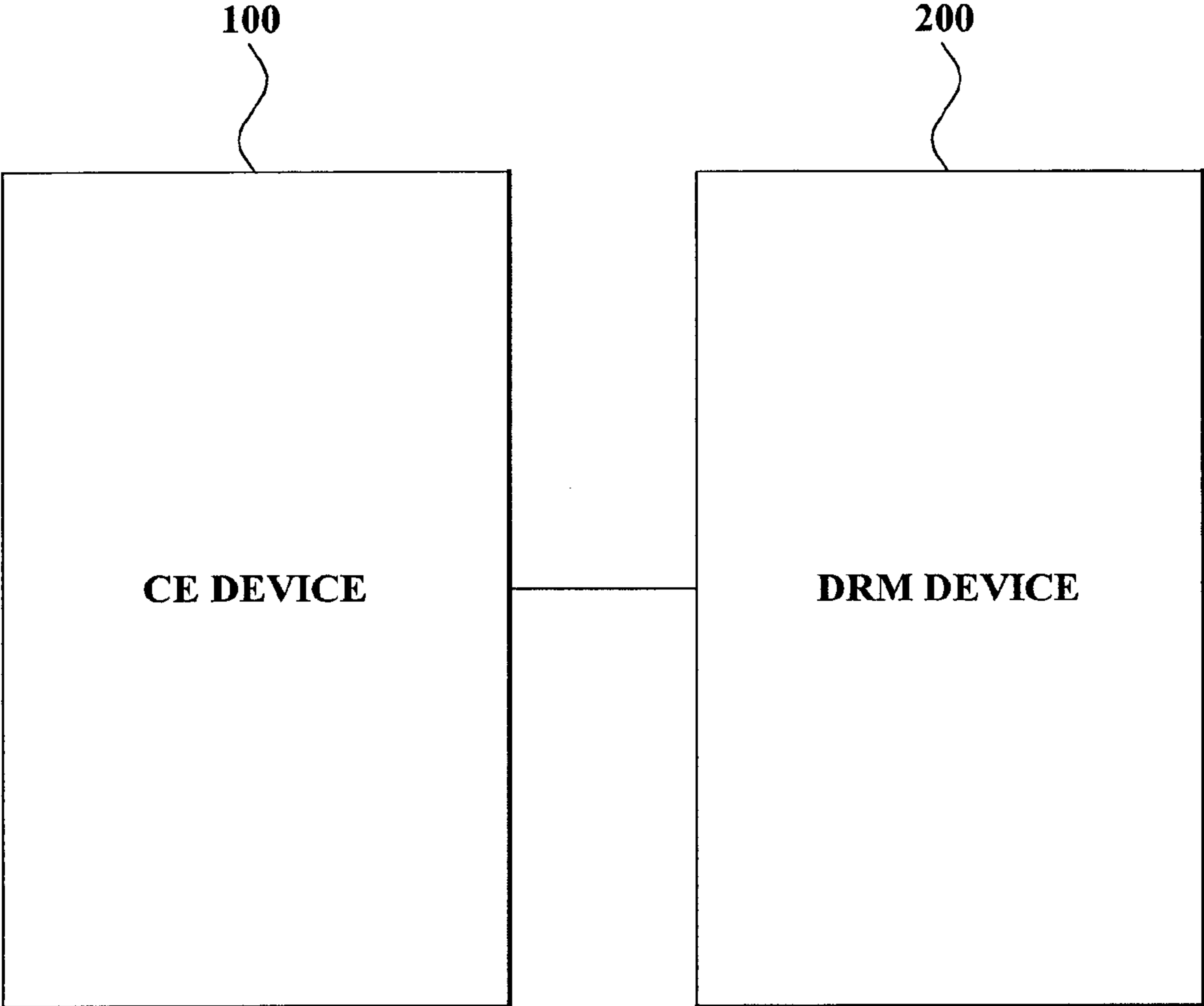


FIG. 2

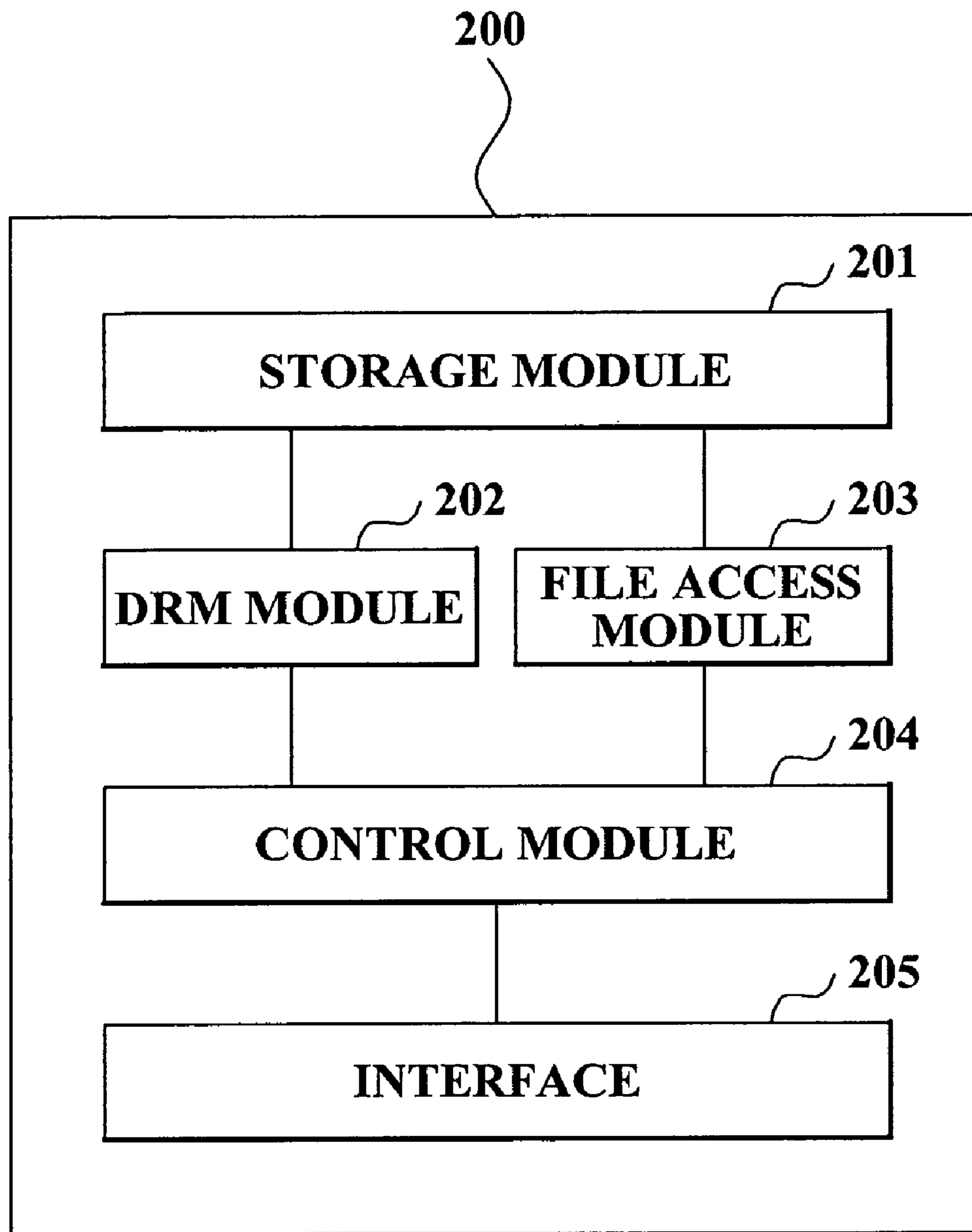


FIG. 3

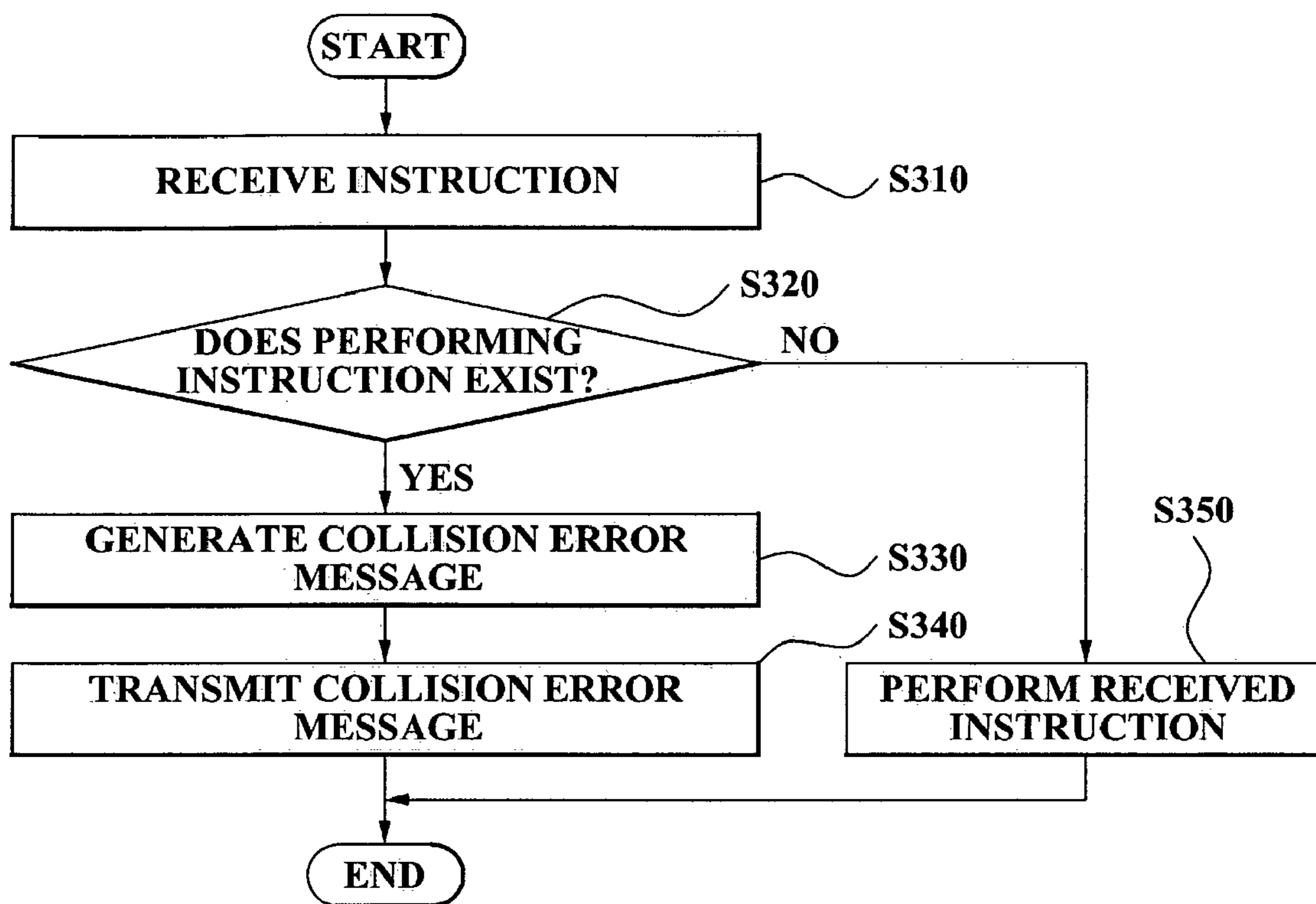
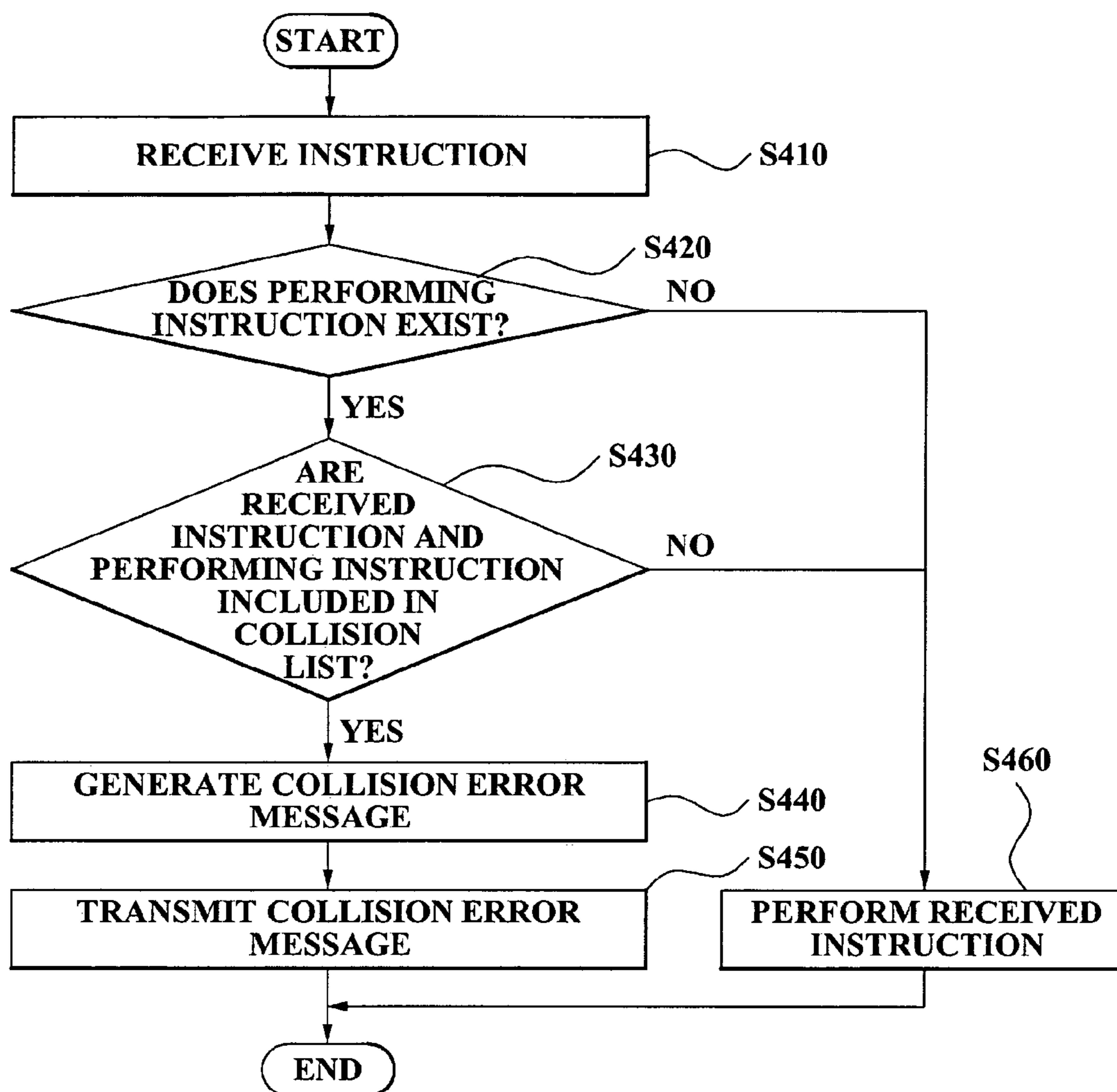


FIG. 4



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METHOD FOR SUPPORTING MUTUAL EXCLUSION FUNCTION AND DRM DEVICE THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit under 35 U.S.C. §119 (a) of Korean Patent Application No. 10-2007-0009522, filed on Jan. 30, 2007, in the Korean Intellectual Property Office, the entire disclosure of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a mutual exclusion function. More particularly, the present invention relates to a mutual exclusion method on a digital rights management (DRM) device connected to a consumer electronics (CE) device, and a DRM device using the method.

2. Description of Related Art

A mutual exclusion function generally indicates a function which controls to enable only a single process to access a common variable or resource when a plurality of parallel processes access the common variable or resource in order to properly operate the plurality of parallel processes. When a file requiring a digital rights management (DRM) function is accessed by a plurality of users, a consumer electronics (CE) device provides the mutual exclusion function.

The DRM function is to securely protect rights and benefits of a contents service provider, to prevent illegal copying, and support from generation, distribution, and management of contents, such as charging for use of the contents and a payment service for the contents. The DRM function may prevent an unauthorized user from using the contents when the user does not pay the fee for the contents by equipping a security authentication system for individual contents.

A collision error may occur associated with more than two instructions associated with an identical file since the CE device having an embedded operation system (OS) may provide the mutual exclusion function, however a CE device not having the embedded OS may not provide the mutual exclusion function.

Accordingly, there is a need for a new method and system that can variously perform the mutual exclusion function required to support a CE device that does not have an embedded OS.

SUMMARY OF THE INVENTION

An aspect of exemplary embodiments of the present invention is to address at least the above problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of exemplary embodiments of the present invention is to provide a mutual exclusion method and a DRM device which can prevent a collision error occurring due to more than two instructions associated with an identical file by determining whether to perform an inputted instruction according to a feature of a performing instruction being performed on a digital rights management (DRM) device connected to a consumer electronics (CE) device.

According to an aspect of exemplary embodiments of the present invention, there is provided a mutual exclusion method on a DRM device connected to a CE device. The method includes receiving an instruction associated with a predetermined stored file from the CE device, checking

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whether a performing instruction being performed associated with the predetermined stored file exists, and generating a collision error message informing that a collision error has occurred due to the inputted instruction when the performing instruction being performed associated with the predetermined stored file exists.

According to an aspect of exemplary embodiments of the present invention, there is provided a DRM device for connecting to a CE device and including an interface receiving an instruction associated with a predetermined stored file from the CE device, a control module generating a collision error message informing that a collision error has occurred due to the inputted instruction when a performing instruction associated with the predetermined stored file exists, and a DRM module performing a DRM function with respect to an accessed file according to the performing instruction of the control module.

Other objects, advantages, and salient features of the invention will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses exemplary embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features, and advantages of certain exemplary embodiments of the present invention will be more apparent from the following detailed description, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a configuration diagram briefly illustrating a system according to an exemplary embodiment of the present invention;

FIG. 2 is a configuration diagram illustrating a DRM device performing a mutual exclusion function according to an exemplary embodiment of the present invention;

FIG. 3 is a flowchart illustrating a mutual exclusion function performing method according to an exemplary embodiment of the present invention; and

FIG. 4 is a flowchart illustrating a mutual exclusion function performing method according to another exemplary embodiment of the present invention.

Throughout the drawings, the same drawing reference numerals will be understood to refer to the same elements, features, and structures.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

The matters defined in the description such as a detailed construction and elements are provided to assist in a comprehensive understanding of the embodiments of the invention. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. Also, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

FIG. 1 is a configuration diagram briefly illustrating a system according to an exemplary embodiment of the present invention.

As illustrated in FIG. 1, the system according to the exemplary embodiment of the present invention may include a consumer electronics (CE) device **100**, and a digital rights management (DRM) device **200** being connected to the CE device **100** to perform a mutual exclusion function.

The CE device **100** may include various electronic devices such as a set top box (STB), a personal computer (PC), a notebook, a personal digital assistant (PDA), and a mobile communication terminal.

The DRM device **200** may perform a DRM function, may be detachably connected to the CE device **100** via a wired interface such as a universal serial bus (USB) port, and may be connected to the various electronic devices to be utilized via a wireless interface such as Bluetooth.

In addition to the CE device **100** where the DRM device **200** is directly connected, the DRM device **200** may be indirectly connected to be utilized for various electronic devices via a wired/wireless network.

For example, the DRM device **200** may be embodied as a smart card type such as a Subscriber Identity Module (SIM) card, a Removable User Identity Module (R-UIM) card, and a Universal Subscriber Identity Module (USIM) card.

FIG. **2** is a configuration diagram illustrating a DRM device performing a mutual exclusion function according to an exemplary embodiment of the present invention.

As described in FIG. **2**, the DRM device **200** may include a storage module **201**, a DRM module **202**, a file access module **203**, a control module **204**, and an interface **205**.

The storage module **201** may store at least one file. The file access module **203** may access the storage module **201** according to a performing instruction of the control module **204** to access the stored at least one file, and the DRM module **202** may perform a DRM function with respect to the at least one stored file, having been accessed according to the performing instruction of the control module **204**.

The interface **205** receives an instruction associated with a predetermined stored file from a CE device to output the inputted instruction to the control module **204**. The control module **204** may generate a collision error message informing that a collision error has occurred due to the inputted instruction when the performing instruction associated with the predetermined stored file exists.

The control module **204** may check whether the inputted instruction and the performing instruction are included in a collision list when the performing instruction associated with the at least one stored file exists, and may generate a collision error message informing that a collision error has occurred due to the inputted instruction when the inputted instruction and the performing instruction are included in the collision list.

FIG. **3** is a flowchart illustrating a mutual exclusion function performing method according to an exemplary embodiment of the present invention.

As illustrated in FIG. **3**, the mutual exclusion function performing method according to the exemplary embodiment of the present invention may include step **S310** of receiving an instruction associated with a predetermined stored file, step **S320** of checking whether a performing instruction being performed associated with the predetermined stored file exists, step **S330** of generating a collision error message, step **S340** of transmitting the collision error message, and step **S350** of performing the inputted instruction.

Hereinafter, the mutual exclusion function performing method according to the exemplary embodiment of the present invention will be described.

The DRM device **200** of FIG. **2** may receive the instruction associated with the predetermined stored file from the CE device **100** of FIG. **1**. In an exemplary implementation, the instruction is to access the predetermined stored file, and may include any one of a read, a write, a modify, and a delete instruction.

In an exemplary implementation, the DRM device **200** may perform a mutual exclusion function by itself to be compatible with CE devices having an embedded OS or without the embedded OS.

In step **320**, the interface **205** of FIG. **2** receives the instruction associated with the predetermined stored file from the CE device **100** of FIG. **1** to output the inputted instruction to the control module **204** of FIG. **2**, and the control module **204** checks whether the performing instruction associated with the predetermined stored file exists.

The control module **204** generates the collision error message informing that a collision error has occurred due to the inputted instruction when the performing instruction associated with the predetermined stored file exists in step **S330**, and the interface **205** transmits the collision error message to the CE device **100** in step **S340**.

The control module **204** performs the inputted instruction when the performing instruction associated with the predetermined stored file does not exist in step **S350**.

For example, when user A is performing a read instruction associated with a predetermined stored file, and when user B inputs a read instruction associated with the predetermined stored file, the control module **204** may not perform the inputted instruction since the inputted instruction and the performing instruction are associated with the identical predetermined stored file.

The file access module **203** of FIG. **2** accesses a corresponding file among the predetermined stored file according to the performing instruction of the control module **204**, and the DRM module **202** may perform the DRM function with respect to the accessed file.

Subsequently, the DRM device **200** of FIG. **2** may process an appropriate file, which is verified via the DRM function, according to the inputted instruction. Specifically, the DRM module **202** decodes audio files protected by the DRM function to output the decoded audio files to speakers or earphones of the CE device **100**, or decodes video or text files to display the decoded video or text files via a display module of the CE device **100**.

As described above, the mutual exclusion function performing method according to the exemplary embodiment of the present invention may prevent a collision from occurring due to instructions associated with an identical file, and also may prevent a plurality of users from simultaneously reading and playing the identical file. To enable simultaneous reading of the identical file, a mutual exclusion function performing method according to another exemplary embodiment of the present invention will be described by referring to FIG. **4**.

FIG. **4** is a flowchart illustrating a mutual exclusion function performing method according to another exemplary embodiment of the present invention.

As illustrated in FIG. **4**, the mutual exclusion function performing method according to the other exemplary embodiment of the present invention may include step **S410** of receiving an instruction associated with a predetermined file, step **S420** of checking whether a performing instruction being performed exists, step **S430** of checking whether the inputted instruction and the performing instruction are included in a collision list, step **S440** of generating a collision error message, step **S450** of transmitting the collision error message, and step **S460** of performing the inputted instruction.

The interface **205** of FIG. **2** receives the instruction associated with the predetermined file to output the inputted instruction to the control module **204** in step **S410**. The con-

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control module **204** checks whether the performing instruction being performed associated with the predetermined stored file exists in step **S420**.

The control module **204** checks whether the inputted instruction and the performing instruction are included in the predetermined collision list in step **S430**. In an exemplary implementation, the predetermined collision list may include instructions having a probability that a collision error may occur when the instructions are simultaneously performed on an identical file. As an example, the predetermined collision list may include a read and write, a read and modify, and a read and delete instructions. The control module **204** performs the inputted instruction when the performing instruction associated with the predetermined stored file does not exist in step **S460**. The control module **204** generates the collision error message informing that a collision error has occurred due to the inputted instruction when the inputted instruction and the performing instruction are included in the collision list in step **S440**. The interface **205** transmits the generated collision error message to the CE device **100** of FIG. **1** in step **S450**.

Also, the control module **204** performs the inputted instruction when inputted instruction and the performing instruction are not included in the collision list in step **S460**.

For example, when user A is performing a read instruction associated with a predetermined stored file, and when user B inputs a read instruction associated with the predetermined stored file, the control module **204** may perform both of the read instructions since even though the inputted instruction and the performing instruction are associated with the identical predetermined stored file, the inputted instruction and the performing instruction are not included in a collision list.

Conversely, when user A is performing a read instruction associated with a predetermined stored file, and when user B inputs a delete instruction associated with the predetermined stored file, the control module **204** may not perform the delete instruction.

The mutual exclusion method according to the above-described exemplary embodiments of the present invention may be recorded in computer-readable media including program instructions to implement various operations embodied by a computer. The media may also include, alone or in combination with the program instructions, data files, data structures, and the like. Examples of computer-readable media include magnetic media such as hard disks, floppy disks, and magnetic tape; optical media such as CD ROM disks and DVD; magneto-optical media such as optical disks; and hardware devices that are specially configured to store and perform program instructions, such as read-only memory (ROM), random access memory (RAM), flash memory, and the like. The media may also be a transmission medium such as optical or metallic lines, wave guides, and the like including a carrier wave transmitting signals specifying the program instructions, data structures, and the like. Examples of program instructions include both machine code, such as produced by a compiler, and files containing higher level code that may be executed by the computer using an interpreter. The described hardware devices may be configured to act as one or more software modules in order to perform the operations of the above-described exemplary embodiments of the present invention.

According to exemplary embodiments of the present invention, there is provided a mutual exclusion method and DRM device which may prevent a collision error occurring due to more than two instructions associated with an identical file by determining whether to perform an inputted instruc-

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tion according to a feature of a performing instruction being performed on a DRM device connected to a CE device.

While the invention has shown and described with reference to certain exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the appended claims and their equivalents.

What is claimed is:

1. A mutual exclusion method on a digital rights management (DRM) device connected to a consumer electronics (CE) device, the method comprising:

receiving an instruction associated with a predetermined stored file from the CE device;

checking whether a performing instruction being performed associated with the predetermined stored file exists; and

generating a collision error message informing that a collision error has occurred due to the inputted instruction when the performing instruction being performed associated with the predetermined stored file exists.

2. The method of claim **1**, wherein the performing instruction operates to access the predetermined stored file, and comprises any one of a read, a write, a modify, and a delete instruction.

3. The method of claim **1**, further comprising: performing the inputted instruction when the performing instruction associated with the predetermined stored file does not exist.

4. The method of claim **1**, further comprising: decoding the predetermined stored file associated with the inputted instruction such that the inputted instruction is performed to output the decoded file.

5. The method of claim **1**, further comprising: checking whether the inputted instruction and the performing instruction are included in a predetermined collision list when the performing instruction associated with the predetermined stored file exists;

generating the collision error message informing that the collision error has occurred due to the inputted instruction when the inputted instruction and the performing instruction are included in the collision list.

6. The method of claim **5**, wherein the collision list includes instructions having a probability that a collision error may occur when the instructions are simultaneously performed on an identical file.

7. The method of claim **5**, further comprising: performing the inputted instruction when the inputted instruction and the execution instruction are not included in the collision list.

8. The method of claim **7**, further comprising: decoding the file associated with the inputted instruction such that the inputted instruction is performed to output the decoded file.

9. The method of claim **1**, further comprising: transmitting the generated collision error message to the CE device.

10. A computer-readable medium of computer executable instructions for controlling a digital rights management (DRM) device connected to a consumer electronics (CE) device, comprising:

a first set of instructions for controlling an interface of the DRM device to receive an instruction associated with a predetermined stored file from the CE device;

a second set of instructions for controlling a control module of the DRM device to check whether a performing

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instruction being performed associated with the predetermined stored file exists; and
 a third set of instructions for controlling a DRM module of the DRM device to generate a collision error message informing that a collision error occurred due to the inputted instruction when the performing instruction being performed associated with the predetermined stored file exists.

11. A DRM device for being connected to a consumer electronics (CE) device, the device comprising:

an interface for receiving an instruction associated with a predetermined stored file from the CE device;

a control module generating a collision error message informing that a collision error occurred due to the inputted instruction when a performing instruction associated with the predetermined stored file exists; and

a DRM module performing a DRM function with respect to an accessed file according to the performing instruction of the control module.

12. The DRM device of claim **11**, wherein the instruction operates to access the predetermined stored file, and comprises any one of a read, a write, a modify, and a delete instruction.

13. The DRM device of claim **11**, wherein the control module performs the inputted instruction when the performing instruction associated with the predetermined stored file does not exist.

14. The DRM device of claim **11**, wherein the DRM module decodes a file associated with the inputted instruction such that the inputted instruction is performed to output the decoded file.

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15. The DRM device of claim **11**, wherein the control module checks whether the inputted instruction and the performing instruction are included in a predetermined collision list when the performing instruction associated with the predetermined stored file exists, and generates the collision error message informing that the collision error occurred due to the inputted instruction when the inputted instruction and the performing instruction are included in the collision list.

16. The DRM device of claim **15**, wherein the control module performs the inputted instruction when the inputted instruction and the performing instruction are not included in the collision list.

17. The DRM device of claim **16**, wherein the DRM module decodes the file associated with the inputted instruction such that the inputted instruction is performed to output the decoded file.

18. The DRM device of claim **16**, wherein the collision list includes instructions having a probability that a collision error may occur when the instructions are simultaneously performed on an identical file.

19. The DRM device of claim **11**, further comprising:

a storage module storing at least one file to manage; and

a file access module for accessing to the storage module according to the performing instruction of the control module to access the predetermined stored file.

20. The DRM device of claim **11**, wherein the DRM device is detachable from the CE device, and is embodied as a smart card capable of storing multimedia information.

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